# Health Assessment for





NORTH INDIAN BEND WASH

SCOTTSDALE, MARICOPA COUNTY, ARIZONA

CERCLIS NO. AZD980405069

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## SUMMARY

The North Indian Bend Wash (NIBW) National Priorities List Site is located in the City of Scottsdale, Indian Bend Wash, Maricopa County, Arizona. Site contaminants have contaminated several municipal potable groundwater wells within the site study area. Five affected wells were removed from potable service. The city of Scottsdale installed volatile organic compounds (VOC) treatment for one of the affected wells which has since been returned to service, and instituted a water quality monitoring program at all city wells to prevent exposure to groundwater VOC contaminants. Contaminants of concern in groundwater include: chloroform, 1,1-dichloroethylene, tetrachloroethylene, 1,1,1-trichloroethane, and trichloroethylene (TCE). Lead was also detected in groundwater but does not appear to be a site-related contaminant. Untreated groundwater within the site area is currently used for potable, industrial, and irrigation purposes. Potential pathways for human exposure to site-related contaminants include ingestion of contaminated groundwater and food chain entities, inhalation of volatilized organic chemicals, and dermal contact with contaminated groundwater or surface water. Contamination associated with the NIBW Site serves as an potential health threat since trichloroethylene were detected in groundwater samples taken from wells, presumably used for drinking water, at levels that were in excess of present or proposed drinking water Maximum Contaminant Levels.

The proposed alternatives for remediation of groundwater contamination in the Middle and Lower Aquifers within the NIBW area have been reviewed by the Agency for Toxic Substances and Disease Registry (ATSDR) to assess the environmental and public health implication of each aquifer following remediation. The alternatives for the Operable Unit all provide varying levels of effectiveness at mitigating the impacts of contamination in the Middle and Lower Aquifers. Only those alternatives which would reduce groundwater contamination to levels that would not impact on human health were felt to be adequate.

## BACKGROUND

### A. Site Description

The NIBW Site is located in an area which includes southern Scottsdale, northern Tempe, and a small section of the Salt River Indian Reservation. Available site information did not include specific site boundaries but addressed the site according to the site study area which consisted of an area approximately 6-miles long and 2 miles wide (See Appendix 1). Several industrial facilities, including Motorola, Beckman, and Microsemiconductor, were operated within the site area and used a variety of chemicals, including VOCs, in their industrial processes. The Motorola and Beckman facilities are located upgradient of five municipal wells that, in 1981, were removed from potable service because levels of VOCs exceeded Arizona Department of Health Service Action Levels. One of the wells was equipped with a VOC treatment system and was returned to potable service.

### B. Site Visit

A visit to the NIBW Site was not conducted by staff members of ATSDR. It was determined that available information was adequate to describe the site and surrounding area.

## ENVIRONMENTAL CONTAMINATION AND PHYSICAL HAZARDS

### STUDY AREA MAXIMUM CONTAMINANT LEVELS

Groundwater 1983-1987~

| Contaminant | Maximum Level |
|---|---|
| Boron | 973 ppb |
| Bromomethane | 42 ppb |
| Chloroform | 160 ppb* |
| 1,1-Dichloroethane | 35 ppb* |
| 1,2-Dichloroethane | 20 ppb* |
| 1,1-Dichloroethylene | 650 ppb* |
| Lead | 901 ppb# |
| Methyl ethyl ketone | 350 ppb* |
| Methylene chloride | 110 ppb |
| Tetrachloroethylene | 37 ppb |
| Trichloroethylene | 2,500 ppb* |
| 1,1,2-Trichloro-2,2,1-trifluoroethane | 20 ppb# |
| Zinc | 5,200 ppb |

~Groundwater samples were filtered prior to analysis.
#Beckman Instruments Monitoring Wells.
*Motorola Monitoring Wells.
ppb-parts per billion.

Active Municipal Wells^

| | Phoenix | Scottsdale | Tempe |
|---|---|---|---|
| Chloroform | ND | 2.5 ppb | ND |
| Lead | ND | 48 ppb | ND |
| Trichloroethylene | 14 ppb | 7 ppb | 18.5 ppb |

ND-Not Detected.
ppb-parts per billion.
^Municipal wells are presumed to be active although available information does not clearly state the status of use.

Inactive Municipal Wells
City of Scottsdale

| | |
|---|---|
| Chloroform | 8 ppb |
| Tetrachloroethylene | 11 ppb |
| Trichloroethylene | 520 ppb |

ppb-parts per billion

Irrigation Wells

| | |
|---|---|
| Boron | 700 ppb |
| 1,1-Dichloroethylene | 30 ppb |
| Tetrachloroethylene | 135 ppb |
| 1,1,1-Trichloroethane | 415 ppb |
| Trichloroethylene | 1,400 ppb |

ppb-parts per billion

Surface Water 1984~

| | |
|---|---|
| Chloroform | 0.95 ppb |
| Tetrachloroethylene | 1.7 ppb |
| Trichloroethylene | 57 ppb |

~Only Reported Contaminants.

Soil Gas #

| | |
|---|---|
| 1,1-Dichloroethylene | 284 ppb |
| Tetrachloroethylene | 9 ppb |
| 1,1,1-Trichloroethane | 66 ppb |
| Trichloroethylene | 43 ppb |

#-Location and date of sample collection not provided
Samples may have been collected from either on-site and off-site areas.
ppb-parts per billion.

C. PHYSICAL HAZARDS

Based on the review of available information there appear to be no physical hazards associated with the NIBW Site.

## DEMOGRAPHICS

Approximately 70 percent of Scottsdale (lying within the NIBW area) is residential, 23 percent commercial, and the remaining seven percent is undeveloped open space. The 1986 population of Scottsdale was approximately 115,000 with projections that the population will reach 130,000 by 1990.

## DATA NEEDS AND EVALUATION

A. Site Characterization

1. Environmental Media

Groundwater, soil gas, surface water, and fish samples were collected from the study area, however, in many cases data were outdated or insufficient to adequately characterize current site conditions.

Groundwater samples were filtered prior to analysis for inorganic chemical contaminants, therefore, detected inorganic contaminant levels may not be representative of levels which are ingested. Analyses from filtered samples are not comparable to the U.S. Environmental Protection Agency (EPA) Drinking Water Standards. These standards are based on unfiltered or total concentrations of contaminants, not just the dissolved fraction.

The contractor responsible for writing the Endangerment Assessment reported that data were inadequate to characterize soil contamination in the NIBW area. Soil gas data did not include ambient levels of contaminants and therefore where used for qualitative purposes only.

Surface water and fish samples were obtained in 1984, however, it is unlikely that results of the 1984 sampling program represent current conditions. Contaminant levels of fish were determined from homogenized whole fish rather than from muscle tissue only. Data were not provided on the results of fish analyses or whether or not sampled fish were species commonly eaten by residents in the study area.

Additional sampling (groundwater, soil, soil gas, and fish bioassay) has been conducted. Results of analysis will be available in the Remedial Investigation (RI) expected to be completed in July 1989. The RI will be reviewed when ATSDR receives this document and, if necessary, an addendum to this Health Assessment will be issued.

2. Demographics and Land Use

Demographic and land use data were insufficient to complete this Health Assessment. Available demographic data were very general in nature and provided a broad overview of the entire Scottsdale Municipality. Information on site-specific areas of contamination was not provided.

3. Quality Assurance/Quality Control

The Health Assessment is based on the data provided to ATSDR. The accuracy of these conclusions is determined by the availability and reliability of the data.

B. Environmental Pathways

Environmental pathways for the movement of contaminants include those related to groundwater, surface water, soil gas, and air. Soil may also serve as a contaminant reservoir, however, soil sampling results were not available for the ATSDR review.

The levels of groundwater contaminants in the study area were highest near the Beckman Instruments and Motorola facilities. Groundwater movement in the Upper Aquifer is to the west-northwest while groundwater movement in the Middle and Lower aquifers in the NIBW area is to the north-northwest. Water level data indicates a downward-directed vertical gradient between the Upper and Middle Aquifers and also between the Middle and Lower Aquifers.

Nine reportedly active municipal potable water wells are located downgradient of the areas with the highest groundwater contaminant levels, although the status of use for several of these municipal wells is questionable. Of the nine municipal wells, five are screened only in the Middle and Lower aquifers, one is screened only in the Lower Aquifer, one screened in the Lower, Middle, and Upper aquifers, and two wells have an unknown screened interval.

Two active municipal wells were located upgradient of the Motorola Facility and adjacent to the Beckman Instrument Facility. Municipal wells within the site vicinity are tested on a regular basis. If water from municipal wells exceeds EPA Drinking Water Standards (DWS) the water is treated to meet DWS or it is not used. One of the municipal wells is screened in the Upper, Middle, and Lower Aquifers while the other is screened in only the Middle and Lower Aquifers.

Four other wells within the study area were classified as industrial use wells. However, it is not clear whether these wells are strictly used only for industrial purposes, they may also be used to supply drinking water. Groundwater within the site area is also used for agricultural irrigation. In those instances where contaminated groundwater is used for agricultural irrigation, bioaccumulation in edible agricultural products may occur.

Groundwater contamination may have impacted surface water and sediments within several ponds located in the NIBW Area. The Indian Bend Wash serves as a buffer system of lakes to control any flood waters and move them to the Salt River. These lakes also serve as water holding basins for discharge from irrigation wells. Between late 1984 and early 1985 swimming, wading, and fishing restrictions were imposed on lakes and connector streams within the NIBW which have been impacted by contaminated groundwater. Contaminants from sediments and surface water may bioaccumulate in aquatic organisms such as fish.

Soil-gas could potentially serve as an important pathway for contaminant migration. However, information was not available to determine the extent of soil-gas contamination or the direction of soil-gas migration. The site lies in an area where the houses are constructed on poured concrete slabs. It is therefore unlikely that gases would accumulate in these residences.

C. Human Exposure Pathways

All current exposure pathways can not be adequately evaluated in this Health Assessment. Additional sampling will be required before it can be determined if site-related contaminants pose a threat to public health. Contaminant concentrations in food chain entities such as crops irrigated with contaminated groundwater or edible wild plants or animals and in soil and sediments have not been reported. Available surface water, air (soil gas), and fish tissue sampling results are inadequate.

Signs are posted which advise against swimming, wading, and fishing in ponds located within the Indian Bend Wash. It is unlikely that these warning signs will be totally successful in stopping the ingestion, inhalation, and dermal contact exposures to contaminants in surface water, sediments, and fish.

Ingestion, inhalation, or dermal contact exposures to contaminated groundwater from municipal wells in Phoenix, Scottsdale, and Tempe should be minimal since these wells are tested on a regular basis and are used only after treatment.

## PUBLIC HEALTH IMPLICATIONS

The public health implications of exposures to contaminants present in surface water, air (soil gas), and fish and potentially present in other food chain entities, soil, and sediments cannot be evaluated because of inadequate.

Current exposures to contaminants in the ponds located within the North Indian Bend Wash may be occurring. Reported contaminant levels are sufficiently low that exposure to the ponds seem to pose no public health threat. Additional sampling data may identify exposures of concern.

Contaminant concentrations in the municipal wells of Phoenix, Scottsdale, and Tempe are currently not of concern for inhalation and dermal contact exposures. However, TCE concentrations in these wells are such that ingestion of untreated water would be of public health concern. Lead concentrations in the Scottsdale well would also be of public health concern for ingestion exposures.

All wells in the Scottsdale central water distribution system are tested and if contaminant concentrations exceed drinking water standards, the well water is either treated or not blended with water in the distribution system. Therefore, ingestion exposure to water from the Scottsdale system should not be of public health concern.

Additional health implications involve possible future activities at the NIBW site. Remedial workers involved with pumping or treating groundwater or excavating sediments or soil may receive exposures of public health concern. If increased demands for potable water are met with water from municipal wells that are currently contaminated, treatment of water from these wells will be necessary to reduce contamination to acceptable levels.

## CONCLUSIONS AND RECOMMENDATIONS

This site is of potential public health concern because of possible human exposure to hazardous substances at concentrations that may result in adverse health effects. As noted in the Public Health Implications Section above, human exposure to trichloroethylene and lead does not appear to be currently occurring, however, these contaminants have been detected in Scottsdale municipal wells. Water from these wells is either treated prior to distribution through the municipal system or not used for potable purposes.

In accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, the North Indian Bend Wash site, Maricopa County, Arizona, has been evaluated for appropriate follow-up with respect to health effects studies. Since human exposure to site contaminants may have occurred in the past, and may currently be occurring, this site is being considered for follow-up health studies. After consultation with Regional EPA staff and State and local health and environmental officials, the Epidemiology and Medicine Branch, Office of Health Assessment, ATSDR, will determine if follow-up public health actions or studies are appropriate for this site.

Based on the information submitted to ATSDR, a complete characterization of the health threat posed by this site is not possible. Additional information concerning the nature and extent of contamination present in surface water, air, fish and other food chain entities, soil, and sediments must be provided before such an evaluation can be made.

ATSDR recommends the following to protect public health.

1. Sample surface and subsurface soil to determine the nature and extent of site contamination.

2. Determine if edible fish species and stream and pond sediments and surface water in the NIBW have levels of contamination which would make the area unsuitable for fishing, swimming, and wading.

3. Conduct a well inventory within the NIBW area impacted by groundwater contamination. Private and public wells located within the impacted area should be monitored to determine if they are suitable for continued use.

4. Continue to sample on-site and off-site monitoring and potable water wells to track movement of groundwater contamination.

5. Continue to monitor municipal wells within the site vicinity to ensure that water used for potable purposes does not have contaminant levels exceeding health based standards (EPA or State of Arizona DWS). If levels are of public health concern water from contaminated wells should be treated or removed from service.

6. The remediation workplan should include the following:

Workers conducting remedial activities should use adequate personal protective equipment which meets the Occupational Safety and Health Administration (OSHA) standards. Appropriate National Institute for Occupational Safety and Health (NIOSH) recommendations should also be taken into account.

Dust generated during remedial activities should be optimally controlled.

During remedial activities, real-time work site periphery air monitoring should be done in addition to on-site air monitoring. Levels of contaminants in the ambient air at the periphery of the site should not exceed the National Ambient Air Quality Standards (NAAQS) or NIOSH recommendations.

## PREPARERS OF REPORT


| | |
|---|---|
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| Health Effects Reviewer: | Mike Allred, Ph.D.<br>Environmental Health Scientist<br>Health Sciences Branch |
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# APPENDICES

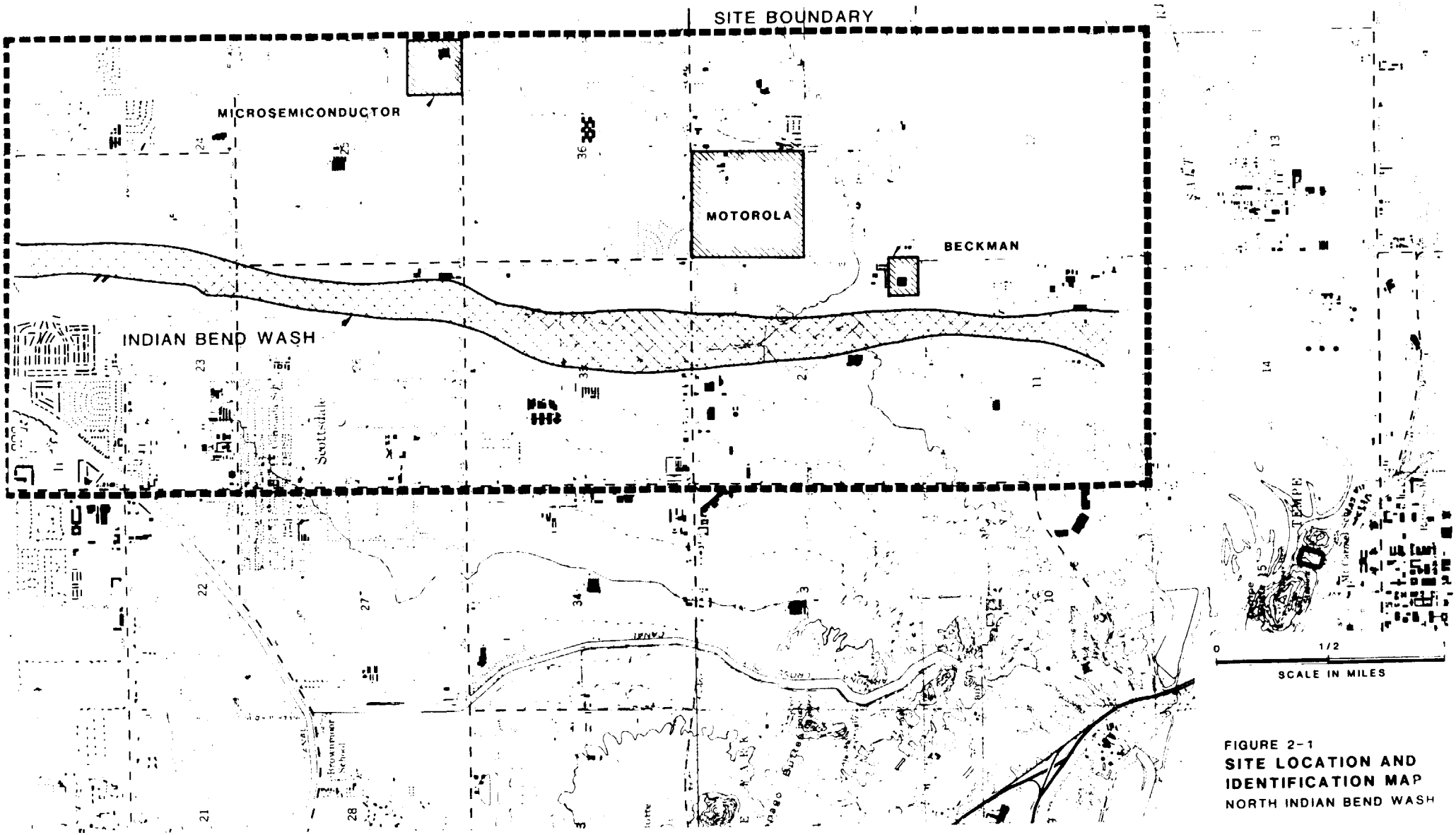


FIGURE 2-1
**SITE LOCATION AND IDENTIFICATION MAP**
NORTH INDIAN BEND WASH

APPENDIX 2

PROPOSED REMEDIAL ALTERNATIVES

P.0. No Action Alternative

P.1. Pumping from Middle and Lower Alluvial Units with Scottsdale City Wells Number 31, 71, 72, 73, and 75 at respective design capacities and Well Number 6 at 50% design capacity.

P.2 Pumping from Middle and Lower Alluvial Units with Scottsdale City Wells Number 31, 71, 72, 73, and 75 at 75% of their respective design capacities and Well Number 6 at 50% design capacity.

P.3 Pumping from Middle and Lower Alluvial Units with Scottsdale City Wells Number 71 and 72 at their respective design capacities and Wells Number 6, 31, 73, and 75 at 50% respective design capacities. In addition, three new groundwater extraction wells will be added within the zone of affected groundwater.

P.4 Pumping from the Middle and Lower Alluvial Units with Scottsdale City Wells Number 71 and 72 operated at their respective design capacities, Well Number 6 at 50% of its capacity for 50 years, and Wells Number 31, 73, and 75 at 50% of their respective capacities for an initial 10 years. Three additional extraction wells will be added after the initial 10 years in the same location as those indicated in Alternative P.3.

Groundwater treatment for each of the alternatives involving groundwater extraction will consist of packed column aeration and/or granular activated carbon absorption. Alternatives P.2, P.3, and P.4 will treat the groundwater to reduce contaminant levels to either one of the following:

| Compound | Treatment Goal Alternative A | Treatment Goal Alternative B |
|---|---|---|
| Chloroform | 0.5 ug/L | 0.5 ug/L |
| 1,1-dichloroethylene | 7.0 ug/L | 3.5 ug/L |
| Tetrachloroethylene | 0.67 ug/L | 0.5 ug/L |
| 1,1,1-trichloroethane | 200.0 ug/L | 100.0 ug/L |
| Trichloroethylene | 5.0 ug/L | 3.0 ug/L |

Source: Draft Operable Unit Feasibility Study for Remediation of Groundwater in the Southern Scottsdale Area, April 1988.